FINDING OF NO SIGNIFICANT IMPACT
MORDECAI ISLAND COASTAL WETLANDS RESTORATION PROJECT
SECTION 1135, IMPROVEMENTS TO THE ENVIRONMENT
OCEAN COUNTY, NEW JERSEY

OVERVIEW

The United States Army Corps of Engineers has evaluated the construction of a wave barrier in Barnegat Bay, Ocean County, New Jersey. Mordecai Island is located near Beach Haven Borough, New Jersey and is adjacent to the New Jersey Intracoastal Waterway (NJIWW), the main navigation channel of Barnegat Bay.

PURPOSE AND SPECIFICATIONS

The goal of the Mordecai Island Coastal Wetlands Restoration Project is to reduce the wave-induced erosion occurring on Mordecai Island, a valuable island for fish and wildlife resources.

STUDY/PROJECT DESCRIPTION

Mordecai Island has a topography composed of widespread areas of salt marsh and varying degrees of exposed sod or grass-covered slopes. The island's approximately 45 acres also support areas of common reed, bayberry, winged sumac, and eastern red cedar. Large areas of submerged aquatic vegetation, consisting primarily of eelgrass, are located off the southwestern edge of Mordecai Island.

The entire coastline of Mordecai Island has suffered from erosion; however, the western edge, adjacent to the New Jersey Intracoastal Waterways navigation channel, has receded at a more substantial rate on the order of 3 - 6 ft. per year. Over the past 100 years, half the island has been lost through erosion. The navigation channel in its present position, running parallel to Mordecai Island at a distance of approximately 800 ft., was last dredged to a depth of 6 ft. in 1975.

Continued erosion of Mordecai Island threatens an abundant diversity of natural wildlife habitats including open marsh, salt ponds, exposed mud flats, shrub-dominated areas and shallow water eelgrass beds. These habitats provide breeding, foraging, nesting and resting areas for many species of migratory birds, including shorebirds, wading birds, raptors and waterfowl. Over 20 species of birds have been observed on Mordecai Island. Two of these species, the American bittern (*Botaurus lentiginosus*) and the black skimmer (*Rynchops niger*), are included on the New Jersey Department of Environmental Protection's (NJDEP) state endangered species list and the black-crowned night heron (*Nycticorax nycticorax*) is considered threatened by NJDEP. In addition, Mordecai Island was designated as an Important Bird and Birding Area (IBBA) by the New Jersey Audubon Society in 2005. Furthermore, the widespread areas of eelgrass in the shallow tidal flats provide refuge for many young finfish and crustaceans. The continual erosion along the western edge of Mordecai Island threatens this rich diversity of natural habitats.

The main goal of the Mordecai Island Coastal Wetlands project is to preserve and protect Mordecai Island's diverse natural bird and marine habitats by stabilizing the shoreline and reducing future erosion. Since many of the finfish species found in the eelgrass are recreationally and commercially valuable, protecting their habitats would be both ecologically and economically important. Several shore protection measures were evaluated for erosion reduction of the western edge of Mordecai Island, and an offshore wave barrier was the selected plan.

COORDINATION

The project was developed by cooperating agencies including: the U.S. Army Corps of Engineers; the Mordecai Land Trust; New Jersey Department of Environmental Protection; and the U.S. Fish and Wildlife Service, New Jersey Field Office.

The Environmental Assessment (EA) for the project was forwarded to the U.S. Environmental Protection Agency Region II, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the New Jersey Department of Environmental Protection, and all other known interested parties.

ENDANGERED SPECIES IMPACT

The Environmental Assessment has determined that the selected plan, if implemented, would not jeopardize the continued existence of any species or the critical habitat of any fish, wildlife or plant, which is designated as endangered or threatened pursuant to the Endangered Species Act of 1973 as amended by P.L. 96-159.

WATER QUALITY COMPLIANCE

Pursuant to Section 401 of the Clean Water Act, a 401 Water Quality Certificate will be obtained for this project through the New Jersey Department of Environmental Protection, Land Use Regulation Program.

COASTAL ZONE

Based on the information gathered during the preparation of the Environmental Assessment, and the application of appropriate measures to minimize project impacts, it was determined in accordance with Section 307(C) of the Coastal Zone Management Act of 1972 that the plan complies with and can be conducted in a manner that is consistent with the approved Coastal Zone Management Program of New Jersey. A consistency determination from the New Jersey Department of Environmental Protection will be received prior to project construction.

CULTURAL IMPACTS

The New Jersey State Historic Preservation Office has reviewed the conceptual design for the project under Section 106 of the National Historic Preservation Act and has concluded that the project will have no adverse effect upon cultural resources in the area.

RECOMMENDATION

Because the Environmental Assessment concludes that the work described is not a major Federal action significantly affecting the human environment, I have determined that an Environmental Impact Statement is not required.

Date

Robert J. Ruch
Lieutenant Colonel, Corps of Engineers
District Engineer

DRAFT
ENVIRONMENTAL ASSESSMENT

MORDECAI ISLAND COASTAL WETLANDS RESTORATION PROJECT
SECTION 1135, IMPROVEMENTS TO THE ENVIRONMENT
OCEAN COUNTY, NEW JERSEY

PREPARED BY:
PHILADELPHIA DISTRICT
U.S. ARMY CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA 19107

June 2006

Draft
Environmental Assessment
Mordecai Island Coastal Wetlands Restoration Project
Section 1135, Improvements to the Environment
Ocean County, New Jersey

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1.0 Project Location

Mordecai Island is located near Beach Haven Borough, New Jersey (Figures 1) and is adjacent to the New Jersey Intracoastal Waterway (NJIWW), the main navigation channel of Barnegat Bay. Barnegat Bay is a heavily used recreational boating area located approximately 25 miles north of Atlantic City, New Jersey.

2.0 Study Authority

The U.S. Army Corps of Engineers' (Corps) authority for the Mordecai Island Coastal Wetlands Restoration Project is Section 1135 of the Water Resources Development Act of 1986, as amended, which is used for improvements to the environment in the public interest. The purpose of the project under Section 1135 is to reduce wave erosion and the impact of the New Jersey Intracoastal Waterway (NJIWW) on Mordecai Island. Strong tidal currents and the wakes of vessels using the NJIWW, a federal project that runs parallel to Mordecai Island's western shore, are the chief causes of the erosion.

3.0 Purpose and Need for Action

Mordecai Island has a topography composed of widespread areas of salt marsh and varying degrees of exposed sod or grass-covered slopes. The island's approximately 45 acres also support areas of common reed, bayberry, winged sumac, and some eastern red cedar. Large areas of submerged aquatic vegetation, consisting primarily of eelgrass, are located off the southwestern edge of Mordecai Island.

The entire coastline of Mordecai Island has suffered from erosion; however, the western edge, adjacent to the NJIWW, has receded at a more substantial rate on the order of 3 - 6 ft. /year. Over the past 100 years, half the island has been lost through erosion and an analysis of historical aerial photographs was able to quantify that erosion rate to specific dates (Table 1, Figure 2). The federal navigation channel in its present position (Photo 1), runs parallel to Mordecai Island at a distance of approximately 800 ft, and was last dredged to a depth of 6 ft. in 1975. Since then, erosion rates along Mordecai Island's western shore have increased to 3 – 6 ft. /yr.

Continued erosion of Mordecai Island (Photo 2) threatens an abundant diversity of natural wildlife habitats including open marsh, salt ponds, exposed mud flats, shrub-dominated areas and shallow water eelgrass beds. These habitats provide breeding, foraging, nesting and resting areas for many species of migratory birds, including shorebirds, wading birds, raptors and waterfowl. Over 20 species of birds have been observed on Mordecai Island. Two of these species, the American bittern (*Botaurus lentiginosus*) and the black skimmer (*Rynchops niger*), are included on the New Jersey Department of Environmental Protection's (NJDEP) state endangered species list and the black-crowned night heron (*Nycticorax nycticorax*) is considered threatened by NJDEP. In addition, the widespread areas of eelgrass in the shallow tidal flats provide refuge for many young finfish and crustaceans. The continual erosion along the western edge of Mordecai Island threatens this rich diversity of natural habitats.

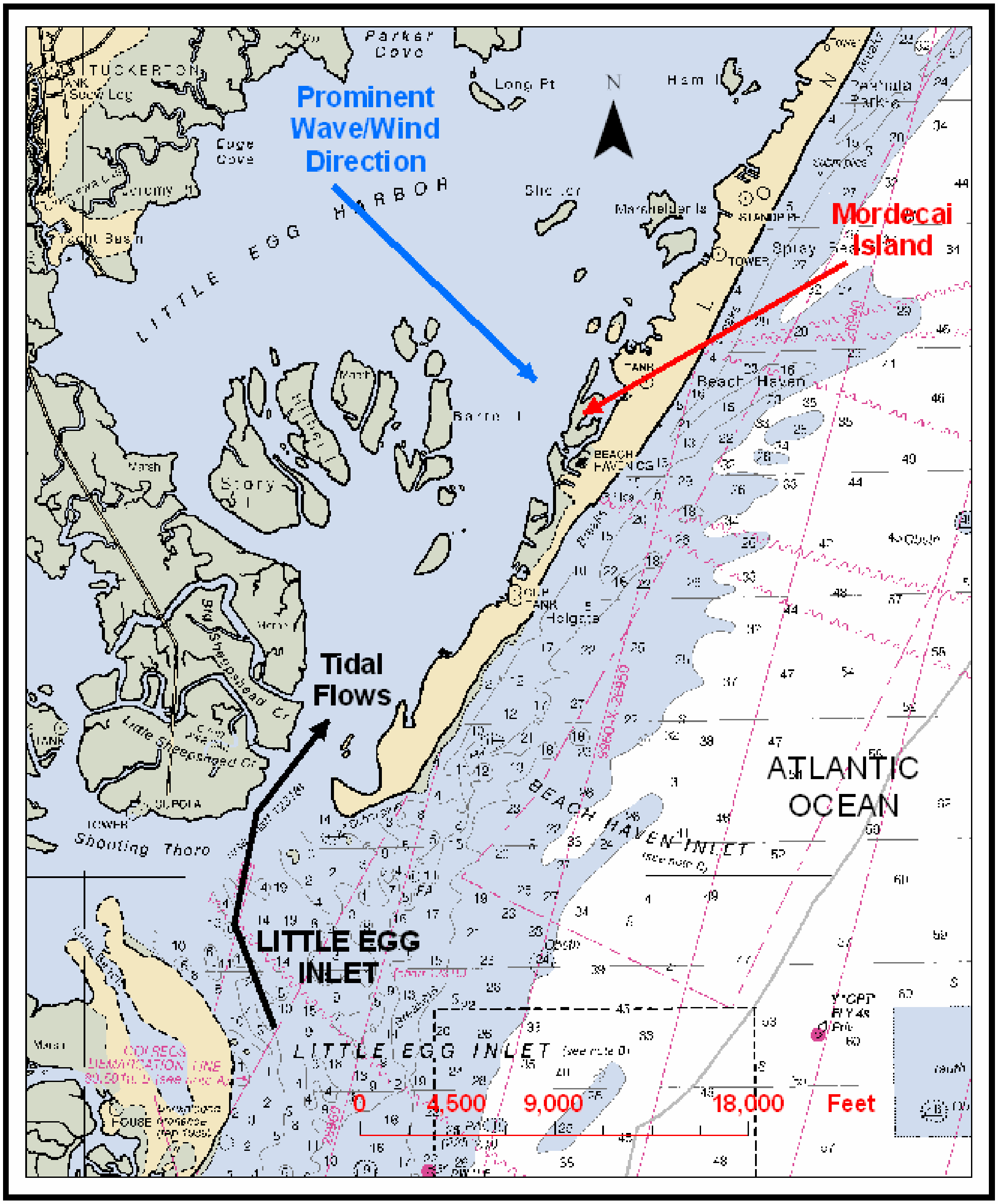

Figure 1. General vicinity map of Eastern New Jersey showing the project site.

Figure 2. Project location and a historical comparison of Mordecai Island.

Table 1. Erosion rates at Mordecai Island.						
Year	Northern Island Area (acres)	Southern Island Area (acres)	Total Area (acres)	Percent loss since 1888	Total Area Lost since 1888 (acres)	Yearly Area Lost (acres/yr)
1888	-	-	65.57	-	-	-
1971	-	-	36.43	44	29.14	0.35
1977	-	-	34.50	47	31.07	0.32
1991	1.08	29.81	30.88	53	34.69	0.26
1995	1.05	28.64	29.68	55	35.89	0.30
2002	0.87	27.40	28.27	57	37.30	0.20

Note: The footprint of Mordecai Island was digitized from historical aerial photographs. Aerial photos did not exist for the extreme northern and southern ends of the island for each year being analyzed, so the northern and southern limits of the erosion analysis were represented by the 2 transects. The island's footprint area was calculated in AutoCAD and results were tabulated in Table 1.

Photo 1: Aerial Photo of Mordecai Island showing the close proximity of the Intracoastal Waterway and the breach in the island (October 2001).

Photo 2: Erosion on the shore of Mordecai Island (October 2001).

4.0 Alternatives

Since 2002, the Corps and one of the project's co-sponsors, Mordecai Land Trust, have been considering various alternatives to reduce the erosion to Mordecai Island. The following alternatives were considered and the majority are summarized in Table 3.

4.1 No-action

The no action alternative would allow the continued erosion of Mordecai Island. Over time, the size of the island and the available habitat on the island for wildlife would shrink. This option would not accomplish the project goals.

4.2 Alternatives located on or near Mordecai Island

- Articulated concrete
- Offshore wave barrier (breakwater)
- Geotube w/armor layer

- Vinyl sheet pile bulkhead
- Riprap revetment
- Biolog
- Wave absorbers
- Non-structural (no wake zone for boats)

Early coordination with the resource agencies (U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the New Jersey Department of Environmental Protection) resulted in the consensus that none of the harden structural alternatives would be acceptable and permissible from the agencies. Biologs would have a very short life span and could not adequately protect the island from wave erosion. Wave absorbers were also considered; however, they were deemed too experimental and they had no tract record of performance in the field in an environment similar to that of Mordecai Island. Discussions will be initiated with the U.S. Coast Guard to pursue a no boat wake zone around Mordecai Island as part of the proposed solution to the wave erosion. This by itself would not solve the problem of the wave erosion on Mordecai Island, but would prevent further acceleration of the problem. As a result of these early coordination meetings, the above listed alternatives were dismissed and only offshore wave barriers were considered as further viable alternatives.

4.3 Offshore Wave Barriers

4.3.1 Chevron Breakwater

In 2001, Dr. Stuart Farrell, with the Richard Stockton Coastal Research Center, proposed the use of detached emerged breakwaters as a solution to shoreline erosion. Dr. Farrell recommended the use of a series of rock rubble breakwater units placed offshore along the northern third of Mordecai Island where erosion has been the most significant. A geotextile base would be used to slow any subsidence of the rubble into the fine-grained sediments adjacent to the island. The breakwater design would follow the wing pattern found to be successful in work undertaken along the Chesapeake shoreline. The breakwaters would serve to stabilize the island by reducing wave energy reaching the shoreline. The "V"-shape configuration of the breakwater units could also have the added benefit of allowing sediment to impound behind the breakwater.

Three stone chevron detached breakwaters located 500 ft. apart, 300 ft. from the shoreline (each breakwater constructed of two, 100-ft. wings) were proposed. This option was not considered permissible by the resource agencies due to the large footprint of the structure and the environmental impacts anticipated during construction.

4.3.2 Vertical Slat (Picket Fence) Breakwater

A vertical slat breakwater constructed across a maximum length of 1800 ft. and positioned approximately 150 ft. offshore of Mordecai Island is the preferred alternative. To determine what type of vertical slat breakwater is most effective at reducing erosion on Mordecai Island, a wave tank test of three "Vertical Slat Breakwater Designs" was conducted at the Davidson Laboratory of Stevens Institute in 2004. The purpose of the test was to determine the wave transmission and attenuation performance of the three designs under a variety of incident wave conditions typical of storm waves and boat wakes in the vicinity of Mordecai Island.

Stevens Institute selected two wave heights and periods based upon whether the source was from a vessel (2 ft. height with 2 sec. period) or a storm (3.1 ft height with a 4.2 sec. period). Stevens Institute simulated 10 different monochromatic wave events and the steepness parameters for the two design wave conditions fell within the minimum and maximum steepness parameters computed from the 10 monochromatic wave events. Wave steepness is the ratio of wave height over wavelength, and energy that propagates through a structure is known to be a function of wave steepness. The following descriptions are paraphrased from Herrington 2004:

4.3.2.1 Wave Tank Testing Methods

The three modeled prototype breakwaters consisted of vertical piles on 5 ft. centers anchored to the bottom, and diagonal piles for additional lateral support. In addition, horizontal stringers spanned the vertical piles supporting vertical pickets which acted to attenuate the incident wave energy. The three breakwaters varied only in the picket size, spacing, and placement. The three variations were:

Coastal Zone Management (CZM) Regulation Design (3" x 6" Slats) would be constructed of 3 in. x 6 in. slats spaced 3 in. apart and set 18 in. above the seabed on the bayward side of the structure (Figure 3). The full-scale structure was designed to stand 10.3 ft. high in a water depth of 5.7 ft. Mean Lower Low Water (MLLW). At the highest tidal levels, the structure would extend 2 ft. above Mean Higher High Water (MHHW). The plan form area of this design (including stringers) provides for a vertical barrier with 42% porosity between pilings. The porosity of the entire structure (including the 18 in. gap) ranges from 53% at MLLW to 48% at MHHW between pilings.

CZM Intent Design (3" x 6" Slats Staggered Both Sides) would be constructed of 3 in. x 6 in. slats spaced 3½ in. apart and set 18 in. above the seabed placed on both the bayward and landward side of the breakwater. The slats would be offset 3½ in. center-to-center between the bayward and landward sides. The configuration of the slats produce a 3 in. gap between seaward and landward slats oriented at an angle of approximately 25º across the structure (Figure 4). The full-scale structure is designed to stand 10.3 ft. high in a water depth of 5.7 ft. MLLW. At the highest tidal levels, the structure would extend 2 ft. above MHHW. The projected plan form area of this design provided for a vertical barrier with 0% porosity between pilings. The porosity of the entire structure in three-dimensions was the same as the CZM regulation design: 42% porosity between pilings (excluding the 18 in. gap) and between 53% at MLLW to 48% at MHHW between pilings, including the 18 in. gap between the structure and the seabed.

CZM Altered Design (3" x 12" Slats - preferred design) would be constructed of 3 in. x 12 in. slats spaced 2 in. apart, set 18 in. above the seabed on the seaward side of the structure (Figure 5). The full-scale structure is designed to stand 10.3 ft. high in a water depth of 5.7 ft. MLLW. At the highest tidal levels, the structure extends 2 ft. above MHHW. The plan form area of this design provided for a vertical barrier with 14% porosity between pilings. The porosity of the entire structure (including the 18 in. gap) ranges from 38% at MLLW to 31% at MHHW between pilings.

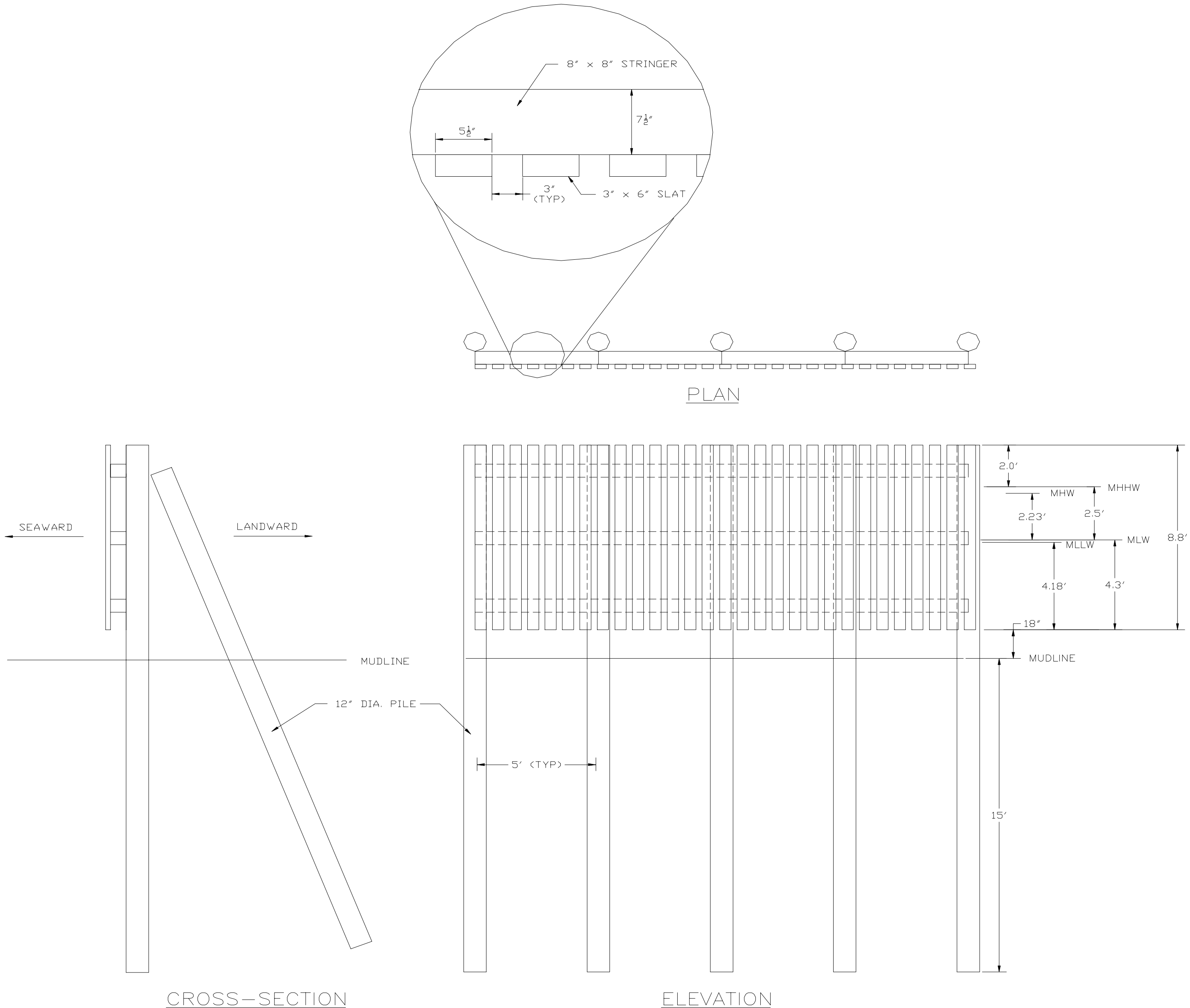

Figure 3. CZM Regulation Design: 3” x 6” slats separated by 3” gaps wave barrier.

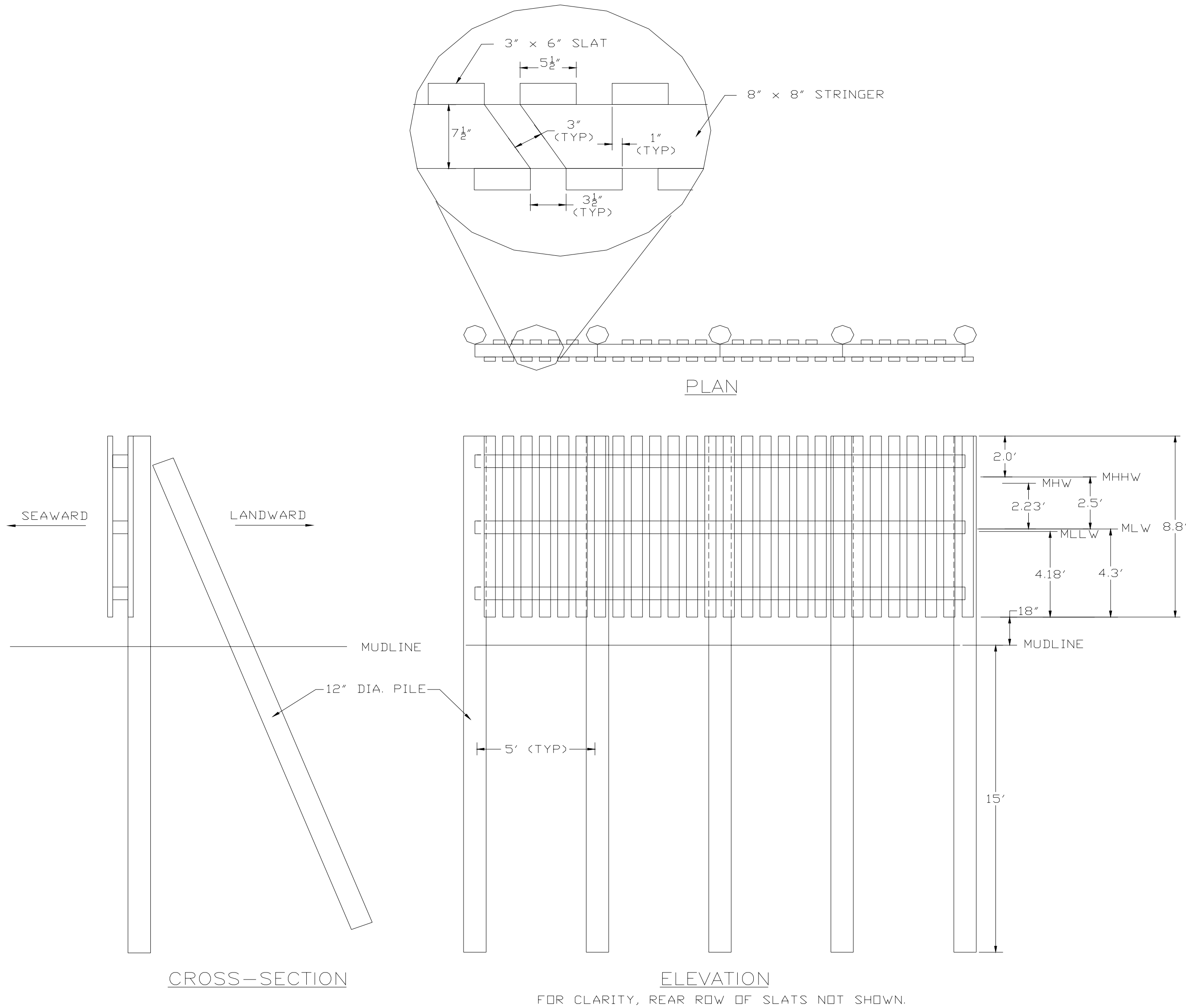

Figure 4. CZM Intent Design: 3" x 6" slats staggered on both sides separated by 3" gaps wave barrier.

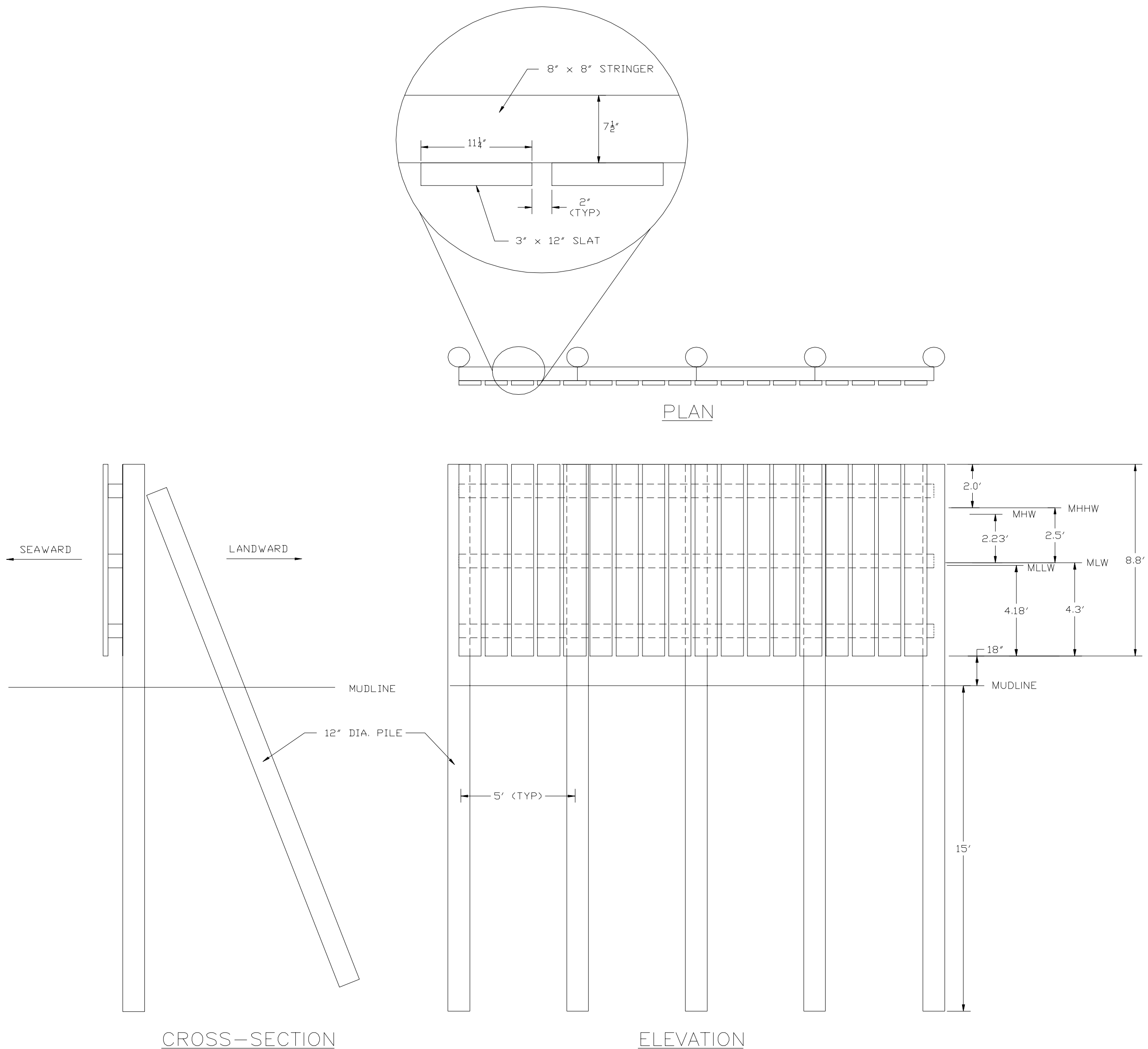

Figure 5. CZM Altered Design (preferred alternative): 3" x 12" slats separated by 2" gaps wave barrier.

4.3.2.2 Wave Tank Testing Results

The evaluation of the three vertical slat breakwaters provided significant insight into the increased efficiency that can be expected by either (1) altering the configuration of the structure or (2) reducing the overall porosity of the structure. The maximum possible wave attenuation achievable by any of the breakwaters tested was 50%. The low attenuation is a direct result of the required 18 in. gap between the base of the breakwater and the seabed that provided the structure with 18 to 26% added porosity depending on the tide level. In order to compensate for the gap at the bottom of the structure, a low porosity wave screen is required.

This experiment compared the function of a structure designed to the currently acceptable CZM standards in New Jersey (CZM Regulation Design), a structure configured to provide more projected plan form area while maintaining the appropriate porosity (CZM Intent Design), and a breakwater designed to minimize the porosity of the structure (Preferred Design).

<u>CZM Regulation Design (3” x 6” Slats)</u>

Of the three designs, the one configured to the current CZM standards of 50% porosity (3 in. x 6 in. slats set 3 in. apart, 18 in. off the bottom) performed the worst. The structure allowed 70% of the shortest and smallest waves and over 90% of the longest waves generated in the test matrix to propagate through the structure (Table 2).

<u>CZM Intent Design (3” x 6” Slats Staggered Both Sides)</u>

The standard 3 in. x 6 in. slat breakwater was altered by adding additional 3 in. x 6in. slats in a staggered fashion to the landward side of the approved breakwater. In this way, the overall porosity of the structure remained at 50%, but the projected plan form area that the wave encounters was reduced to 0%. The wave transmission characteristics of the breakwater, however, were only marginally better than the standard configuration. The structure allowed 65% of the shortest waves and 85% of the longest wave generated in the test matrix to propagate through the structure, making the reconfigured structure only 5% more effective than the CZM regulation design (Table 2).

<u>CZM Altered Design (3” x 12” Slats - Preferred Design)</u>

The low porosity breakwater was constructed with 3 in. x 12 in. slats placed 2 in. apart and set 18 in. above the bottom. The overall porosity of the structure was 38% for the condition tested which was 12% lower than the CZM regulation design. This structure allowed less than 50% of the shortest and smallest waves and less than 70% of the longest waves generated in the test matrix to propagate through the structure. By decreasing the overall porosity of the structure 12%, the amount of wave height attenuation increased by 20%. It can therefore be concluded that decreasing the porosity of a vertical slat breakwater will have a greater impact on wave height reduction than maintaining a porosity level of 50% and altering the geometry of the structure. In addition, the 3 in. x 12 in. slats placed 2 in. apart (38% porosity) was the most effective design as it allowed less than 50% of the shortest waves and less than 70% of the longest waves to pass through the structure. These results conclude that this design is 30% more effective than the CZM regulation design. The CZM altered design is especially critical for shore protection, as it is desirable to achieve 80 to 90 % wave height reduction to reduce erosion. The CZM altered design (Preferred Design) was found to be 64% effective in wave reduction (Table 2).

Table 2. Effectiveness of Proposed Wave Barrier Designs for Various Potential Wave Events.				
Wave Event	**H/L**	**CZM Altered Design (3”x 12”) (Preferred Design)**	**CZM Regulation Design (3”x6”)**	**CZM Intent Design (3”x6”)x2**
1	**0.016**	**49%**	**22%**	**28%**
2	**0.023**	**52%**	**17%**	**24%**
3	**0.036**	**56%**	**28%**	**41%**
4	**0.049**	**64%**	**35%**	**49%**
5	**0.054**	**70%**	**44%**	**56%**
6	**0.055**	**73%**	**42%**	**61%**
7	**0.064**	**52%**	**39%**	**38%**
8	**0.067**	**73%**	**47%**	**58%**
9	**0.077**	**65%**	**41%**	**48%**
10	**0.072**	**84%**	**67%**	**68%**
	Average=	**64%**	**38%**	**47%**

4.3.2.3 Wave Barrier Material Options

The following materials were considered the most viable and cost effective in the design of the wave barrier: Southern Yellow Pine, Poly 21, Greenheart, and Precast Fiber Reinforced Polymer (FRP) Composite Piling.

Southern Yellow Pine is pressure treated lumber commonly used in marine construction, including outfall piles, piers, fenders, and docks. Its ease of installation, excellent material properties, and inexpensive unit cost make it an excellent option in timber construction. For protection against rotting and to extend the expected service life, CCA (Chromated Copper Arsenate) wood preservative is used in all Southern Yellow Pine exposed to humid, moist conditions. Southern yellow pine was deemed unsuitable since the CCA treatment in the timber piles would leach into the marine environment over time, potentially contaminating the surrounding water and adversely impacting aquatic wildlife. An alternative treatment, ACQ (Alkaline Copper Quaternary), was considered instead of CCA, but was also dismissed due to environmental concerns. The cost of pressure treated Southern yellow pine is $9.45 per linear foot.

Poly 21 is a polymer coating that prevents leaching of CCA from treated wood. It is a tough polymer membrane that bonds to wood, preventing destruction from marine borers and dry rot. Poly 21 also resists harmful UV rays and the effects of freezing. Its many applications include use on marine structures such as piers, bulkheads, and docks. Poly 21 was considered a possible solution for containing CCA within the southern yellow pine. In-depth research and discussions with businesses having first hand experience using Poly 21 highlighted durability and cost concerns. The impacts of ice loads on Poly 21 have been shown to damage the polymer coating, exposing the enclosed timber member. As ice impact is a plausible scenario at Mordecai Island, the risk of damage to the Poly 21 coating and the subsequent leaching of CCA from the exposed wood is an unacceptable condition. Additionally, the cost of Poly 21-coated 12-in. diameter timber piles is $27.95 per linear foot, which exceeds the project budget.

Greenheart is an untreated lumber imported predominantly from Guyana. It is highly regarded for marine construction because of its resistance to marine borers, fungi, and termites, in addition to its exceptional high strength properties. Greenheart is the most viable option since its unit cost is comparable with that of Southern Yellow Pine. Additionally, since it is untreated timber, it will not have a negative impact on the aquatic environment and meets the environmental criteria established for this project. The cost of Greenheart timber piles, 12-in. diameter, is approximately $12.75 per linear foot.

Precast Fiber Reinforced Polymer (FRP) Composite Piling is an innovative product provided by Lancaster Composite Inc. The CP-40 pile is resistant to decay, marine borer attack, and consistently demonstrates reliable strength, while providing marine structures with longer service lives, and lower maintenance/life cycle costs. The CP-40 marine piles are a composite of a fiber reinforced polymer (FRP) tube and a high strength concrete core. CP-40 is a practical material that meets our strength criteria while minimizing negative impacts to the environment. The upfront cost for construction, approximately $32.00 per linear foot for a 12-in. diameter pile, is significantly higher than the other materials considered for this project. However, the large initial cost is partially offset by a superior performance life and minimal maintenance/repair costs.

Although the composite piles represent a more durable alternative to timber, the high material cost exceeds the project budget constraints. Consequently, Greenheart was chosen as the material for this project since its unit cost is comparable to that of other traditional timbers. With cost as a limiting factor for the feasibility of this project, Greenheart provides an affordable, pragmatic solution to treated lumber while minimizing any environmental impacts. If Greenheart lumber is unavailable at the time of construction, another non-toxic material may be substituted in lieu of it.

4.4 Alternative Comparison

Table 3. Comparison of Alternatives for the Mordecai Island Restoration Project.

Alternative	**Potential Issues / Support**	**Cost Estimates**	**Benefits**	**Conclusion**
No Action	- Does not solve the problem.	$0	None	Not recommended.
Offshore Wave Barrier (breakwater)	-Requires deep borings and geotech analysis. -**Supported by resource agencies.**	$1800 /linear feet (l.f.).	- Reduce erosion to the island. - Can be used in deeper water - Durability: 20 years	Recommended.
Articulated Concrete	- Aesthetics - Environmental impact on island during construction. - Requires excavation of shoreline.	$650 - $1300 /l.f.	- Vegetation can grow in voids - Durability: 25 years	Not recommended.

Table 3 (cont.). Comparison of Alternatives for the Mordecai Island Restoration Project.

Alternative	Potential Issues / Support	Cost Estimates	Benefits	Conclusion
Chevron Breakwater	- Possible boating hazard. -Large environmental footprint of structure.	$500 - $600/l.f	-Allows littoral transport - Duration: 25+ years	Not recommended.
Geotube w/armor Layer	- Susceptible to debris/vandalism. - Environmental impact on shallow water habitat.	$150/l.f.	- Can be easily removed. - Beneficial use of dredged material. - Durability: 10+ years	Not recommended.
Vinyl Sheet Pile Bulkhead	- Possible wave reflection and scour. - Loss of transition habitat. - Environmental impact during construction.	$550 - $950 /l.f.	- Stops erosion directly to the island - Durability: 20 years	Not recommended.
Riprap Revetment	- Requires excavation of shoreline. - Environmental impact during construction.	$400/l.f	- Wave absorbing shoreline. - Durability: 15 years	Not recommended.
Biolog	- Short lifespan - Would not adequately protect island from wave erosion.	$10/l.f	- Biodegradable and low profile.	Not recommended.

It is anticipated that Mordecai Island will absorb any wave energy that is allowed to pass through the barrier and the barrier is located far enough offshore so that wave reflection (from the shoreline back to the barrier) would not be a factor. The preferred design alternative is the most efficient at reducing waves reaching the island. In addition, it is the least impacting on environmental and cultural resources, and is supported by federal and state resource agencies. The proposed location of the wave barrier can be seen in Figure 6.

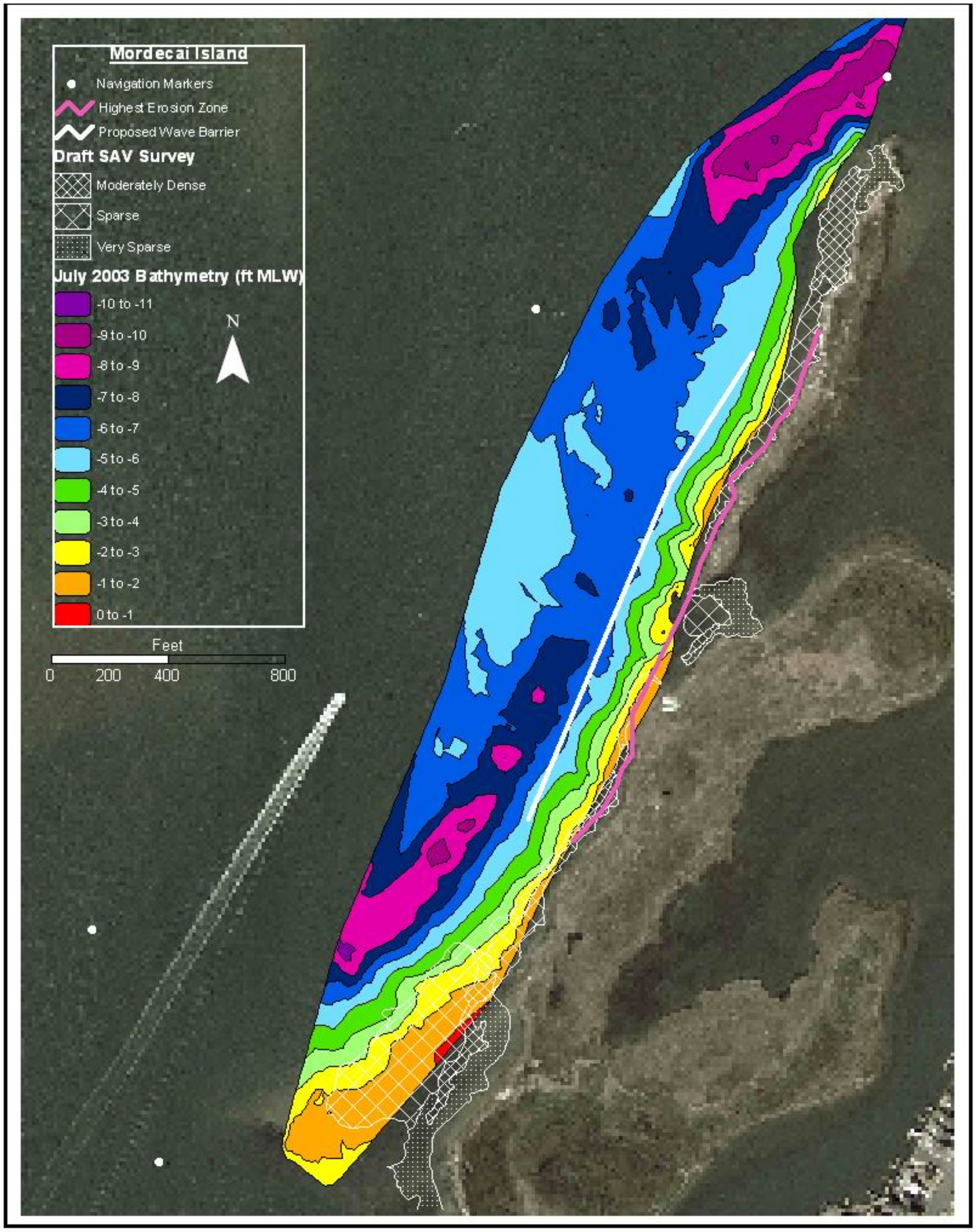

Figure 6. Location of the USACE proposed wave barrier and approximate water depths (relative to MLW) along the western side of Mordecai Island, Ocean County, NJ. Note also the location of the NJ Intracoastal Waterway.

5.0 Environmental Analysis

5.1 Wetlands

The project construction area occurs in shallow water. No wetlands will be impacted by the proposed project construction.

5.2 Submerged Aquatic Vegetation

A comprehensive survey of submerged aquatic vegetation (SAV) and potential SAV habitat located along the western shore of Mordecai Island was completed in 2003. To map the distribution and abundance of SAV on the western side of Mordecai Island, color positive aerial photography was taken at an altitude of 1,500 feet in October 2003 and developed at a scale of 1 inch = 250 feet. SAV beds were identified and delineated by photointerpretation of the SAV signatures on film.

5.2.1 Aerial Survey Results

Approximately 64.5 acres of SAV were mapped around the periphery of Mordecai Island (Table 4). Figure 7 provides a map of the aerial survey results for SAV in the vicinity of Mordecai Island. Only one SAV species, *Zostera marina* (eelgrass), was present. A total of 30.7 % of the SAV cover was categorized as sparse, followed by moderate (27.1%), dense (26.7%), and very sparse (15.5%). Areas with the least dense SAV beds were generally found in deeper water and in areas that experience substantial boat traffic and other disturbances. SAV cover around the western periphery of Mordecai Island was mapped as sparse and moderately dense in most areas; most of which was in a 50 to 60-ft.-wide band. The densest SAV was mapped in one large irregularly-shaped parcel on the eastern side of the island (Versar 2004).

Table 4. Summary of aerially-mapped SAV bed densities within the Mordecai Island, NJ study area (acres). Numbers in square brackets are percentages of the total mapped SAV (Versar 2004).

SAV Density Categories	Quantity (acres)
1 = Very Sparse (0-10%) [15.5%]	9.98
2 = Sparse (10-40%) [30.7%]	19.8
3 = Moderate (40-70%) [27.1%]	17.5
4 = Dense (70-100%) [26.7%]	17.24
TOTAL	**64.52 acres**

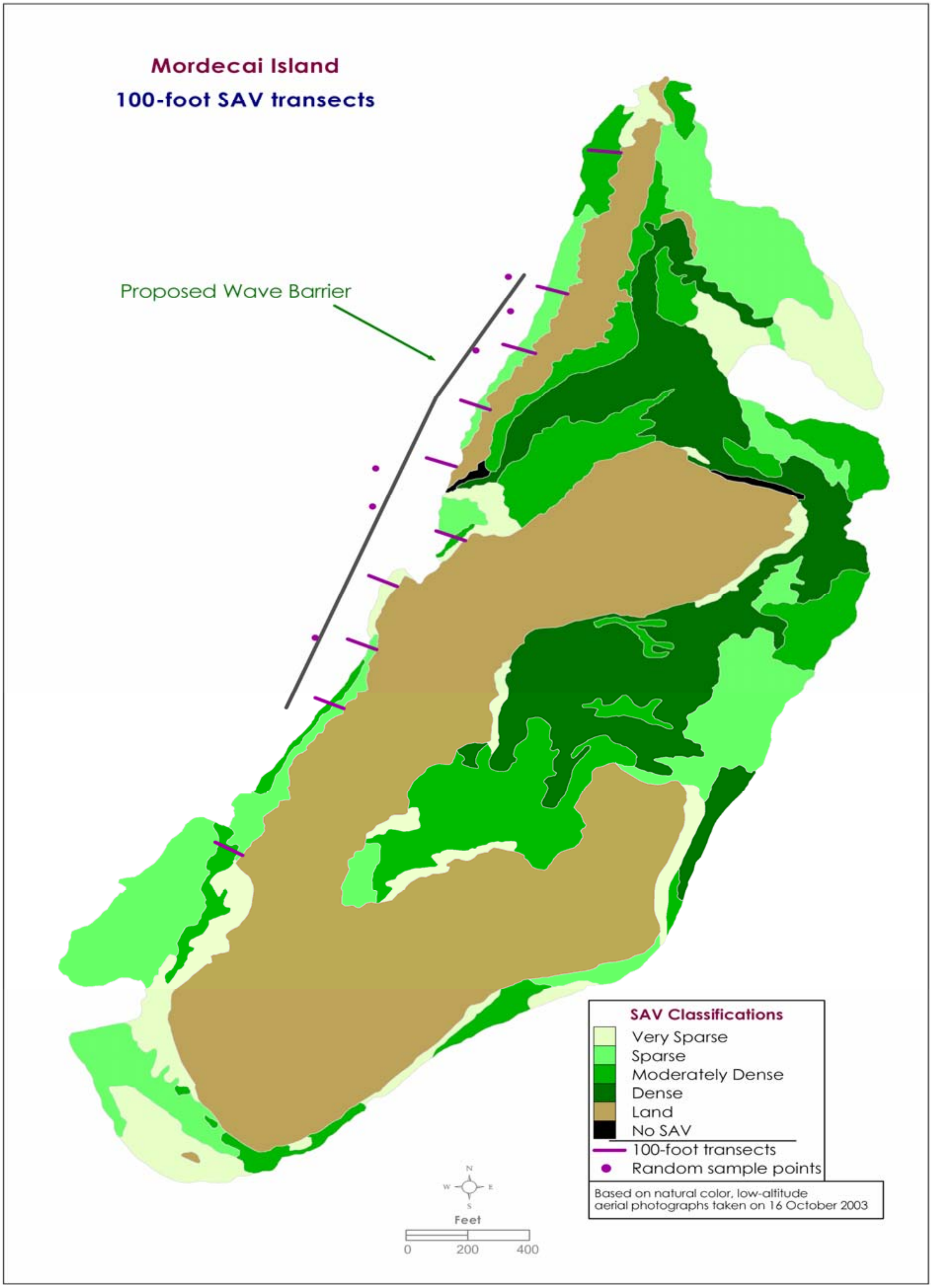

Figure 7. Map of SAV beds in the vicinity of Mordecai Island (Versar 2004).

5.2.2 Ground-truth Survey Results

The ground-truth survey (November 2003) of Mordecai Island confirmed that SAV beds primarily exist in a narrow band of about 50 to 60 ft. wide on the west side of the island.). Figure 6 shows the position of ten 100-ft.-long field-truth transects and random sample points on the western side of the island, adjacent to the proposed USACE wave barrier. The average SAV cover at 0-ft. was 20% (Table 5). The highest densities were observed at the 50-ft. and 100-ft. intervals (38% and 30% cover overall, respectively), although 7 of the 10 stations possessed no SAV. It was also noted that stem counts were very low at almost all stations in the study area. This indicates that while SAV is present along most of the study area, the density is very low. No SAV was present at any of the random sample points, which were all deeper than 4.5 ft. water depth at low tide (Table 5, Versar 2004).

In the geographic region of the project, *Zostera marina* flowers from approximately June through September; no flowering structures were observed on the transects or at the reference points during the November fieldwork. It is also worth noting that slumping of the marsh edges was observed at the beginning (i.e., immediately landward) of all stations at the transects. It appeared likely that the slumping was caused by nearly constant wakes into the western side of the island from boats in the nearby intracoastal waterway (Versar 2004).

Table 5. SAV densities from ground truth transects on the western side of Mordecai Island, Barnegat Bay, NJ (Versar 2004).

Transect	**% SAV Cover at 0 ft./ Stem Count in One Grid**	**% SAV Cover at 50 ft./ Stem Count in One Grid**	**% SAV Cover at 100 ft./ Stem Count in One Grid**	**Random Points % SAV Cover/ Stem Count in One Grid**
1	36/ 1	94/ 5	100/ 7	0/ 0
2	25/ 1	4/ 0	0/ 0	0/ 0
3	12/ 2	50/ 0	0/ 0	0/ 0
4	12/ 1	12/ 0	0/ 0	0/ 0
5	0/ 0	0/ 0	0/ 0	0/ 0
6	100/ 27	100/ 7	100/ 4	0/ 0
7	0/ 0	0/ 0	0/ 0	
8	6/ 0	87/ 6	0/ 0	
9	12/ 0	6/ 0	0 /0	
10	0/ 0	25/ 0	100/ 6	
Average % SAV Cover	**20%**	**38%**	**30%**	**0%**

5.2.3 Proposed Wave Barrier Effects on SAV

The aerial and ground-truth surveys suggest that the direct effects from the proposed wave barrier on SAV at Mordecai Island will be minimal. Based on aerial surveys, ground-truth transects, and random sampling points, it does not appear that SAV currently exists in the proposed location of the wave barrier. This is presumably due to insufficient light penetrating to the substrate at depth possibly as a result of suspended particulates in the water column. Furthermore, existing SAV beds are concentrated in a narrow 50 to 60 ft.-wide band that is a minimum of about 75 to 100 ft. at the closest and about 150 to 180 ft. at the farthest from the proposed location of the wave barrier (Figure 7). Direct effects (i.e., effects during construction of the wave barrier) to SAV at these distances from the island are not likely. Indirect effects from construction of the wave barrier (e.g., siltation, scouring, etc.) are likely to be minimal and temporary, owing to the distance and the generally sparse nature of the existing beds. It is possible, conversely, that the proposed wave barrier could benefit the existing Mordecai Island SAV resources by protecting this area from the current intense level of wave action from boats in the adjacent intracoastal waterway. Very little literature is currently available directly relating to the effects of wave barriers on SAV. Because of its proposed location on the western side, it is not likely that the proposed wave barrier would have either negative or positive effects on SAV beds on the eastern side of Mordecai Island (Versar 2004).

5.3 Fishery Resources

Fish species identified in the project area by sampling conducted by Richard Stockton College in 2001 included: tautog (*Tautoga onitis*), northern puffer (*Sphoeroides maculatus)*, northern pipefish (*Syngnathus fuscus*), winter flounder (*Pleuronectes americanus*), summer flounder (*Paralichthys dentatus*), atlantic silverside (*Menidia menidia*), cunner (*Tautogolabrus adspersus*), threespine stickleback (*Gasterosteus aculeatus*), striped killifish (*Fundulus majalis*), mummichog (*Fundulus heteroclitus*), alewife (*Alosa pseudoharengus*), weakfish (*Cynoscion regalis*), bay anchovy (*Anchoa mitchilli*), American eel (*Anguilla rostrata*), northern sennet (*Sphyraena borealis*), striped burrfish (*Chilomycterus schoepfi*), and bluefish (*Pomatomus saltatrix*).

Essential Fish Habitat

Under provisions of the Magnuson-Stevens Act, areas along the Atlantic coast, including the proposed project area are designated as Essential Fish Habitat (EFH) for species with Fishery Management Plans (FMP's). The NMFS has identified EFH within 10' X 10' square coordinates. The study area contains EFH for various life stages for 16 species of managed fish. Table 6 presents the managed species and their life stage that EFH is identified for the Mordecai Island (Barnegat Bay) project area. Table 7 presents habitat utilization of identified EFH species in the Mordecai Island project area.

Table 6. Summary of Essential Fish Habitat (EFH) Designation for Mordecai Island Project, Barnegat Bay Area (NMFS Website, 2005).				
Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod *(Gadus morhua)*				X
red hake *(Urophycis chuss)*	X	X	X	
winter flounder *(Pleuronectes americanus)*	X	X	X	X
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
Atlantic sea herring *(Clupea harengus)*			X	X
bluefish *(Pomatomus saltatrix)*			X	X
Atlantic butterfish *(Peprilus triacanthus)*			X	
summer flounder *(Paralichthys dentatus)*		X	X	X
scup *(Stenotomus chrysops)*	n/a	n/a	X	X
black sea bass *(Centropristis striata)*	n/a		X	X
king mackerel *(Scomberomorus cavalla)*	X	X	X	X
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	X
tiger shark *(Galeocerdo cuvier)*		X		
dusky shark *(Carcharhinus obscurus)*		X		
sandbar shark *(Carcharhinus plumbeus)*		X	X	X
sandbar shark *(Carcharhinus plumbeus)*		HAPC	HAPC	HAPC

HAPC=Habitat Areas of Particular Concern

Table 7. Habitat Utilization of Identified EFH Species Identified in the Mordecai Island Project Area (Barnegat Bay) (NMFS Website, 2005).

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod *(Gadus morhua)*				Bottom habitats Rocks, pebbles, gravel Temps <10 C 29-34% salinity 10-150 m depth
red hake *(Urophycis chuss)*	Surface waters of inner continental shelf, peaks in June and July. Temps <10 C <25% salinity	Surface waters, peaks in Sept and Oct. Temps <19 C >0.5% salinity <200 m depth	Bottom habitats with shell fragments Temps <16 C 31-33% salinity <100 m depth	
winter flounder *(Pleuronectes americanus)*	Bottom habitats (muddy sand, sand, gravel), February to June. Temps <10 C 10-30% salinity <5 m depth	Pelagic and bottom waters, March to July. Temps <15 C 4-30% salinity <6 m depth	Bottom habitats (mud or fine grained sand) Temps <25 C 10-30% salinity 1-50 m depth	Bottom habitats (mud, sand, gravel) Temps <25 C 15-33% salinity 1-75 m depth
windowpane flounder *(Scophthalmus aquosus)*	Surface waters, peaks May and Oct Temps <20 C <70 m depth	Pelagic waters, peaks May and Oct Temps <20C <70 m depth	Bottom habitats (mud or fine grained sand) Temps <25 C 5.5-36% salinity 1-100 m depth	Bottom habitats (mud or fine grained sand) Temps <26.8 C 5.5-36% salinity 1-100 m depth
Atlantic sea herring *(Clupea harengus)*			Pelagic waters and bottom habitats Temps <10 C 26-32% salinity 15-135 m depth	Pelagic waters and bottom habitats Temps <10 C >28% salinity 20-130 m depth
bluefish *(Pomatomus saltatrix)*			Pelagic waters, Mid-Atlantic estuaries May to Oct Temps 19-24 C 23-36% salinity	Pelagic waters, Mid-Atlantic estuaries April to Oct Temps 14-16 C >25% salinity
Atlantic butterfish *(Peprilus triacanthus)*			Pelagic waters, estuaries spring to fall Temps 3-28 C 3-37% salinity 1-365 m depth (most <120)	
summer flounder *(Paralichthys dentatus)*		Pelagic waters, peaks May and Oct Temps 9-12 C 23-33% salinity 10-70 m depth	Demersal waters (mud, but prefers sand) Temps >11 C 10-30% salinity 0.5-5 m depth	Demersal waters and estuaries 0-25 m depth
scup *(Stenotomus chrysops)*			Demersal waters, spring and summer in estuaries and bays Temps >7 C >15% salinity 0-38 m depth	Demersal waters and inshore estuaries Temps >7 C >15% salinity 2-185 m depth

Table 7. Habitat Utilization of Identified EFH Species Identified in the Mordecai Island Project Area (Barnegat Bay) (NMFS Website, 2005).

MANAGED SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
black sea bass *(Centropristis striata)*			Estuaries in spring and summer; rough bottom, shellfish, and eelgrass beds Temps >6 C >18% salinity 1-38 m depth	Inshore estuaries from May to Oct; structured habitat sand and shell substrates preferred Temps >6 C >20% salinity 20-50 m depth
king mackerel *(Scomberomorus cavalla)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity
Spanish mackerel *(Scomberomorus maculatus)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >30% salinity
cobia *(Rachycentron canadum)*	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity	All coastal inlets; sandy shoals, rock bottom, surf zone Temps >20 C >25% salinity
tiger shark *(Galeocerdo cuvieri)*		Shallow coastal waters <200 m depth		
dusky shark *(Carcharhinus obscurus)*		Shallow coastal waters, inlets, and estuaries <25 m depth		
sandbar shark *(Carcharhinus plumbeus)*		Shallow coastal waters <25 m depth	Shallow coastal waters <25 m depth	Shallow coastal waters <50 m depth

Assessment: Based on the above listed habitat utilization by the designated EFH species, it appears that most of the species will not be found in the immediate project area, due to a depth requirement or the fact that they are migratory in nature (i.e., the sharks). There is the potential for a few species to be found in the project area and these include: winter flounder, windowpane flounder, summer flounder, scup, king mackerel, Spanish mackerel, and cobia. Most of the above-listed fish species are not estuarine resident species and therefore only utilize this area on a seasonal basis, primarily in the warmer summer months. During the summer months, the estuary is typically utilized as a forage area for juveniles and adults and as a nursery area for larvae and juveniles.

Due to the changing availability of federal funds, the actual dates of the proposed in-water construction work are unknown. However, since adults and juveniles of the above-listed species are mobile, it is expected that they will avoid the areas of disturbance regardless of season and therefore will not be impacted. In addition, the actual footprint of the in-water construction work (pile driving) is relatively small so any impacts to demersal eggs and larvae of various species will be minor.

Cumulative Effects on Essential Fish Habitat: We do not anticipate any cumulative effects associated with this project on EFH and managed species. The project will have temporary minor impacts to the bottom habitat and demersal eggs/larvae of some species of Barnegat Bay. However, once the construction of the wave barrier is completed it is likely that the bottom area around the wave barrier will quickly be recolonized. We conclude that the project will have a minimal direct effect on EFH and not result in cumulative impacts to EFH.

Conclusion: Based upon the project design, the minimal short-term impacts associated with the construction of the wave barrier, the Corps believes that the potential adverse impacts to EFH will not be substantial.

5.3 Wildlife Resources

Mordecai Island is an important haven for wildlife in Barnegat Bay. Mordecai Island is especially important for birds, especially migratory shorebirds. The island consists of approximately 67 acres of mixed salt marsh vegetation (*Spartina* spp., *Distichlis spicata*, *Salicornia bigelovi*, etc.) with relatively small upland areas predominated by common reed (*Phragmites australis*), bayberry (*Myrica pensylvanica*), winged sumac (*Rhus copallina*), eastern red cedar (*Juniperus virginiana*), and other species.

The habitats on Mordecai Island provide breeding, foraging, nesting and resting areas for many species of migratory birds, including shorebirds, wading birds, raptors and waterfowl. Over 20 species of birds have been observed on Mordecai Island. Three of these species, the American bittern, black skimmer, and black-crowned night heron are included on the New Jersey Department of Environmental Protection's (NJDEP) state endangered and threatened species list.

Species frequently observed in the Mordecai Island project area include: great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), common tern (*Sterna hirundo*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), laughing gull (*Larus atricilla*), double-crested cormorant *(Phalacrocorax auritus*), belted kingfisher (*Ceryle alcyon*), American oystercatcher (*Haematopus palliatus*), mallard duck (*Anas platyrhynchos*), barn swallow (*Hirundo rustica*), red-winged blackbird (*Agelaius phoeniceus*), and American crow (*Corvus brachyrhynchos*).

Macroinvertebrates identified in the project area by sampling conducted by Richard Stockton College in 2001 included: hard clam (*Mercenaria mercenaria*), hermit crab, grass shrimp (*Palaemonetes pugio*), sand shrimp (*Crangon septemspinosa*), mud crab, blue crab (*Callinectes sapidus*), blue mussel (*Mytilus edulis*), and mud snail.

No long-term impacts to the wildlife resources on Mordecai Island are anticipated as result of this project. Construction of the wave barrier will be completed with offshore barges. There will be temporary noise disturbances as a result of construction activities, but these will be minor in nature and should not have an effect on Mordecai Island wildlife. In addition, by planning the construction of the wave barrier during the fall and winter seasons, impacts to nesting State-listed black skimmers should be avoided.

5.4 Air and Water Quality

The air quality within the project area is reflective of a developed coastal area. Ocean County is designated as a nonattainment area for Ozone (Environmental Protection Agency Web Site, 2005). In addition, Ocean County had 7 days in 2004 above the Air Quality Index of 100 indicating unhealthy levels of air pollutants.

Construction of the proposed wave barrier would cause temporary reduction of local ambient air quality due to fugitive dust and emissions generated by construction equipment and barge traffic. These temporary reductions in air quality would not have a significant impact on the air quality of the surrounding area.

General Conformity Review and Emission Inventory
Mordecai Island

The 1990 Clean Air Act Amendments include the provision of Federal Conformity, which is a regulation that ensures that Federal Actions conform to a nonattainment area's State Implementation Plan (SIP) thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS). In the case of the Mordecai Island, the Federal Action is to complete a 1600 ft wave barrier. The U.S. Army Corps of Engineers, Philadelphia District would be responsible for construction. Ocean County, New Jersey within which the Federal Action will take place is classified as moderate nonattainment for ozone (oxides of nitrogen [NOx] and volatile organic compounds [VOCs]). The Mordecai Island project site is within the Philadelphia-Wilmington-Trenton Nonattainment Area (PA-NJ-DE-MD).

There are two types of Federal Conformity: Transportation Conformity and General Conformity (GC). Transportation Conformity does not apply to this project because the project would not be funded with Federal Highway Administration money and it does not impact the on-road transportation system. GC however is applicable. Therefore, the total direct and indirect emissions associated with the Mordecai Island project must be compared to the GC trigger levels presented below.

Pollutant	General Conformity Trigger Levels (tons per year)
NOx	100
VOCs	50

To conduct a general conformity review and emission inventory for the Mordecai Island project, a list of equipment necessary for construction was identified. Pertinent pieces of equipment include: three boats, cranes (various), pile hammer, and welders. Table 1 (Appendix B) lists these pieces of equipment along with the number of engines, engine size (hp), and duration of operation. A Load Factor (LF) was also selected for each engine, which represents the average percentage of rated horsepower used during a source's operational profile. Load factors were taken from other General Conformity Reviews and Emission Inventories.

Table 1 (see Appendix B) shows the estimated hp-hr required for each equipment/engine category. Hp-hr was calculated using the following equation:

hp-hr = # of engines*hp*LF*hrs/day*days of operation

The second calculation is to derive the total amount of emissions generated from each equipment/engine category by multiplying the power demand (hp-hr) by an emission factor (g/hp-hr). The following equations were used:

$$\text{emissions (g)} = \text{power demand (hp-hr)} * \text{emission factor (g/hp-hr)}$$

$$\text{emissions (tons)} = \text{emissions (g)} * (1 \text{ ton}/907200 \text{ g})$$

Table 2 (see Appendix B) provides the NOx and VOC emission factors selected for each equipment/engine category. These factors were also taken from other General Conformity Reviews and Emission Inventories. Tables 3 and 4 (see Appendix B) present the emission estimates for NOx and VOCs, respectively. The tables present the emissions from each individual equipment/engine category and the combined total.

The total estimated emissions that would result from construction of the wave barrier are 1.92 tons of NOx and 0.31 tons of VOCs. Construction of the project will be completed in 4 months. These emissions are below the General Conformity trigger levels of 25 tons per year for each pollutant. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NOx and VOCs) in a Moderate Nonattainment Area (100 tons and 50 tons of each pollutant per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

Implementation of this project is not expected to alter water quality. All necessary best management practices will be used during construction of the wave barrier to minimize project impacts to the Barnegat Bay. In addition, the contractor will be required to complete a plan that describes measures to prevent hazardous construction materials (e.g., oils) from entering the bay. Furthermore, all construction debris will be disposed of in an appropriate manner. The proposed project will not have any long-term adverse impacts on water quality in Barnegat Bay.

5.5 Threatened and Endangered Species

According to the U.S. Fish and Wildlife Service, the proposed project will have no effect on federally listed species (see Project Correspondence - Appendix A). In addition, consultation with the National Marine Fisheries Service will be concluded prior to project construction to insure that there are no endangered or threatened species under their jurisdiction in the project area. The New Jersey state-listed (endangered) black skimmer is known to nest on Mordecai Island. The nesting colony is the largest in Barnegat Bay and 1 of 2 major black skimmer colonies in the State. According to the New Jersey Division of Fish and Wildlife, there were: 795 adults, 398 nests, and 535 fledglings in 2005 (Pover, Personal Communication, 2006).

Since project construction will occur offshore of Mordecai Island, we do not anticipate any impacts to federal or state-listed species as a result of this project. In addition, based on comments from New Jersey Fish and Wildlife at a July 2004 Joint Permit Process Meeting, a construction restricted period from April 1 – August 1st will be required. By planning construction of this project outside the nesting season, noise disturbances to nesting black skimmers should be avoided.

5.6 Socioeconomics

The Mordecai Island Restoration project is located in a high tourism area. Many people travel to Barnegat Bay for outdoor recreational opportunities, including passive recreation such as bird watching. The proposed project has been supported by numerous state and federal agencies for protecting valuable wildlife habitat as have the local community for economic and environmental reasons.

5.7 Historic and Cultural Resources

The New Jersey State Historic Preservation Office (NJSHPO) has reviewed the conceptual design for the project under Section 106 of the National Historic Preservation Act and has concluded that the project will have no adverse effect upon cultural resources in the area. In a correspondence dated December 26, 2003, NJSHPO concurred with our "no effect" finding for this project.

6.0 Relationship of Selected Plan to Environmental Requirements, Protection Statutes, and Other Requirements

Compliance with environmental quality protection statutes and other environmental review requirements is ongoing. Table 8 provides a listing of compliance with environmental statutes. The Corps has requested all necessary approvals, including but not limited to, a Coastal Zone Management Plan consistency determination from the New Jersey Department of Environmental Protection. In addition, the Corps, through the EA process, has requested a New Jersey State water quality certificate. A Section 404(b)(1) analysis of the Clean Water Act, as amended (Public Law 92-500) was determined not to be necessary for this project based on 33 CFR 323 (1993) that defines fill and states that pilings are not considered fill material and would not constitute a discharge into the waters of the United States.

TABLE 8. Compliance with Appropriate Environmental Quality Protection Statutes and other Environmental Review Requirements.

STATUTE	COMPLIANCE STATUS
Clean Water Act	Partial*
Coastal Zone Management Act	Partial*
Endangered Species Act	Full
Fish and Wildlife Coordination Act	Full
National Historic Preservation Act	Full
National Environmental Policy Act	Partial*
Clean Air Act	Full

NOTE:
Full Compliance: Having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning.
Partial Compliance: Some requirements of the statute, E.O., or other policy and related regulations remain to be met.
*All applicable laws and regulations will be fully complied with upon completion of the environmental review, obtaining state water quality certification, coastal zone consistency determination, and concurrence with our determination on cultural resources.
Noncompliance: None of the requirements of the statute, E.O., or other policy and related regulations remain to be met.

7.0 Coordination

During preparation of the draft Environmental Assessment, several agencies were contacted and provided information. This draft Environmental Assessment is being circulated to various state and federal agencies for comments. Coordination, discussions, and project site visits have been conducted with the U.S. Fish and Wildlife Service, New Jersey Department of Environmental Protection, Mordecai Land Trust, Rutgers University, as well as other agencies and individuals with interests in the project. See Appendix A for more detailed information on the coordination for this project.

8.0 References

Environmental Protection Agency. 2005. AirData: Nonattainment Areas Map. Web Site: http://www.epa.gov/air/data/nonat.html?st~NJ~New%20Jersey

Herrington, T. 2004. Evaluation of the Wave Attenuation Characteristics of Three Vertical Slat Breakwaters. Stevens Institute of Technology, Davidson Laboratory, Technical Report SIT-DL-04-9 2820. NJ Coastal Protection Technical Assistance Service

National Marine Fisheries Service. 2005. Essential Fish Habitat Data. Web Site: http://www.nero.noaa.gov/hcd/

Pover, T. 2006. Personal communication. Biologist. New Jersey Division of Fish and Wildlife. Trenton, New Jersey.

Versar. 2004. Submerged Aquatic Vegetation Characterization and Environmental Review of Shoreline Stabilization in the Vicinity of Mordecai Island, Barnegat Bay, New Jersey. Columbia, Maryland.

9.0 CLEAN AIR ACT STATEMENT OF CONFORMITY

CLEAN AIR ACT STATEMENT OF CONFORMITY
MORDECAI ISLAND COASTAL RESTORATION PROJECT
OCEAN COUNTY, NEW JERSEY

I have determined that the selected plan conforms to the applicable State Implementation Plan (SIP). The Environmental Protection Agency had no adverse comments under their Clean Air Act authority. No negative comments from the air quality management district were received during coordination of the draft environmental assessment. The selected plan would comply with Section 176 (c)(1) of the Clean Air Act Amendments of 1990.

____

Date

____

Robert J. Ruch, P.E.
Lieutenant Colonel, Corps of Engineers
District Engineer

Appendix A

Relevant Project Correspondence

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection
Division of Parks & Forestry, Historic Preservation Office
PO Box 404, Trenton, NJ 08625-0404
TEL: (609) 292-2023 FAX: (609) 984-0578
www.state.nj.us/dep/hpo

Bradley M. Campbell
Commissioner

December 26, 2003
106/04-0479-1
HPO-L2003-229

Minas M. Arabatzis
Chief, Planning Division
Army Corps of Engineers, Philadelphia District
John Wanamaker Building
100 Penn Square East
Philadelphia, Pennsylvania 19107-3391

ATTN: Robert Dunn

Dear Mr. Arabatzis:

Thank you for your letter regarding the Mordecai Island Coastal Wetlands Restoration Project near Beach Haven Borough. It is the opinion of this Office that it is unlikely that there are National Register eligible properties in the project's Area of Potential Effects. Therefore, unless there are significant project changes or archaeological resources are discovered, the Office will concur with a "no effect" finding for this project.

Thank you again for providing this opportunity for review and Consultation. If you have any questions, please do not hesitate to contact Deborah Fimbel, staff reviewer for this project, at 609-984-6019.

Sincerely,

Dorothy P. Guzzo

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

DPG:DRF

ES - 00/669

L.B.I. [illegible]

Partners

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Gian Dodici

Telephone Number : (609) 646-9310

Date: November 12, 2004

I. Region:

Region 5

II. Service Activity (Program)

U.S. Fish and Wildlife Service, Region 5, Ecological Services, New Jersey Field Office (NJFO). *Coastal Program* proposes to stabilize the shoreline on Mordacai Island, Long Beach Island, New Jersey. Mordacai Island is adjacent to the New Jersey Intracoastal Waterway (NJIWW) and is subjected to wakes of heavy marine traffic. The NJFO, in partnership with the U.S. Army Corps of Engineers, proposes to establish a wooden breakwater to reduce erosion rates on the Island.

III. Pertinent Species and Habitat:

A. Listed species and/or their critical habitat within the action area:

None

B. Proposed species and/or proposed critical habitat within the action area:

None

C. Candidate species within the action area:

None

D. Include species/habitat occurrences on a map.

See attached map.

IV. Geographic area or station name and action:

The New Jersey Field Office through the *Coastal Program* proposes to establish a wooden breakwater to reduce erosion rates on Mordacai Island.

V. **Location (attach map):**

A. Ecoregion Number and Name:

Hudson River watershed

B. County and State:

Ocean, New Jersey

C. Section, township, and range (or latitude and longitude):

Beach Haven Boro (UTM 564,181 easting 478,808 northing)

D. Distance (miles) and direction to nearest town:

Mordacai Island lies one-hundred meters northeast of Beach Haven

E. Species/habitat occurrence:

None

VI. **Description of proposed action (attach additional pages as needed):**

The Mordacai Island Restoration project proposes to stabilize the shoreline on Mordacai Island, Long Beach Island, New Jersey. Mordacai Island is adjacent to the New Jersey Intracoastal Waterway and is subjected to strong tidal currents and wakes of marine vessels using the NJIWW. The NJFO, in partnership with the U.S. Army Corps of Engineers, proposes to establish a wooden breakwater to reduce erosion rates on the Island.

VII. **Determination of effects:**

A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C (attach additional pages as needed):

None

B. Explanation of actions to be implemented to reduce adverse effects:

None

VIII. **Effect determination and response requested:** [* = optional]

A. **Listed species/designated critical habitat:**

Determination	**Response requested**
No effect/no adverse modification (Species: None)	X *Concurrence
May affect, but is not likely to adversely affect species/adversely modify critical habitat (Species:)	Concurrence
May affect, and is likely to adversely affect species/adversely modify critical habitat (Species :)	Formal Consultation

Project Biologist (Requestor), New Jersey Field Office — 11-12-4 Date

IX. **Reviewing ESFO Evaluation:**

A. **Concurrence** X **Nonconcurrence** ________

B. **Formal consultation required** ________

C. **Conference required** ________

D. **Informal conference required** ________

E. **Remarks (attach additional pages as needed):**

Endangered Species Biologist (Reviewer), New Jersey Field Office — 12/16/04 Date

Assistant Supervisor, New Jersey Field Office — 12/17/04 Date

Appendix B

Clean Air Assessment

<u>General Conformity Analysis</u>

Table 1. Project Emission Sources and Estimated Power
Table 2. Emission Estimates (NOx)
Table 3. Emission Estimates (VOCs)
Table 4. Pollutant Emissions from Employee Vehicles

General Conformity Review and Emission Inventory for Mordecai Island
Table 1. Project Emission Sources and Estimated Power

hp-hr = # of engines*hp*LF*hrs of operation

Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile.

Equipment/Engine Category	**# of engines**	**hp**	**LF**	**hrs of operation**	**hp-hr**
Air Compr, 750 CFM, 100 PSI	1	250	0.62	100	15500
Chainsaw, 24" to 42" Long Bar	1	2	0.74	710	1051
Crane, ME, Crawler, Lifting 50T/ 65'Boom	1	125	0.43	375	20156
Crane, ME, Crawler, Lifting 100T	1	247	0.43	16	1699
Boat, 21' L-Giant, Trihull, 2800#	1	200	0.40	200	16000
Boat, 29' Rstabout, Trihull, 2600#	1	200	0.40	335	26800
Pile Hammer, Dbl, 40,000 Ft-lbs	1	175	0.70	16	1960
Pile Hammer, Vib, 53T Force Drive	1	175	0.70	235	28788
Trk, HWY 8,600GVW 4x4 Suburban	1	165	0.57	64	6019
Trk, HWY 45,000GVW, 6x4, 3 axle	1	255	0.57	16	2326
Trk, HWY, 8,600GVW	1	165	0.57	32	3010
Welder, 200 AMP, Trailer MTD	1	19	0.40	18	137
Welder, 300 AMP, Trailer MTD	1	24	0.40	11	106
Tug Boat, 150- 400 HP	1	400	0.40	375	60000

Load Factors taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. (May 2003). Prepared for the U.S. Army Corps of Engineers, Philadelphia District by Moffatt & Nichol Engineers.

General Conformity Review and Emission Inventory for Mordecai Island
Table 2. Emission Estimates (NOx)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

NOx Emissions Factor for Off-Road Construction Equipment is 9.20 g/hp-hr

Equipment/Engine Category	**hp-hr**	**EF (g/hp-hr)**	**Emissions (tons)**
Air Compr, 750 CFM, 100 PSI	15500	9.20	0.16
Chainsaw, 24" to 42" Long Bar	1051	9.20	0.01
Crane, ME, Crawler, Lifting 50T/ 65'Boom	20156	9.20	0.20
Crane, ME, Crawler, Lifting 100T	1699	9.20	0.02
Boat, 21' L-Giant, Trihull, 2800#	16000	9.20	0.16
Boat, 29' Rstabout, Trihull, 2600#	26800	9.20	0.27
Pile Hammer, Dbl, 40,000 Ft-lbs	1960	9.20	0.02
Pile Hammer, Vib, 53T Force Drive	28788	9.20	0.29
Trk, HWY 8,600GVW 4x4 Suburban	6019	9.20	0.06
Trk, HWY 45,000GVW, 6x4, 3 axle	2326	9.20	0.02
Trk, HWY, 8,600GVW	3010	9.20	0.03
Welder, 200 AMP, Trailer MTD	137	9.20	0.00
Welder, 300 AMP, Trailer MTD	106	9.20	0.00
Tug Boat, 150- 400 HP	60000	9.20	0.61

Total NOx Project Emissions (tons) = 1.86

General Conformity Review and Emission Inventory for Mordecai Island
Table 3. Emission Estimates (VOCs)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

VOC Emissions Factor for Off-Road Construction Equipment is 1.30 g/hp-hr

Equipment/Engine Category	**hp-hr**	**EF (g/hp-hr)**	**Emissions (tons)**
Air Compr, 750 CFM, 100 PSI	15500	1.30	0.02
Chainsaw, 24" to 42" Long Bar	1051	1.30	0.00
Crane, ME, Crawler, Lifting 50T/ 65'Boom	20156	1.30	0.03
Crane, ME, Crawler, Lifting 100T	1699	1.30	0.00
Boat, 21' L-Giant, Trihull, 2800#	16000	1.30	0.02
Boat, 29' Rstabout, Trihull, 2600#	26800	1.30	0.04
Pile Hammer, Dbl, 40,000 Ft-lbs	1960	1.30	0.00
Pile Hammer, Vib, 53T Force Drive	28788	1.30	0.04
Trk, HWY 8,600GVW 4x4 Suburban	6019	1.30	0.01
Trk, HWY 45,000GVW, 6x4, 3 axle	2326	1.30	0.00
Trk, HWY, 8,600GVW	3010	1.30	0.00
Welder, 200 AMP, Trailer MTD	137	1.30	0.00
Welder, 300 AMP, Trailer MTD	106	1.30	0.00
Tug Boat, 150- 400 HP	60000	1.30	0.09
	Total VOCs Project Emissions (tons) =		0.26

Table 4. Pollutant Emissions from Employee Vehicles

Assumptions:	Average trip distance (1 way) is 25 miles.
	Average NOx vehicle emission factor is 0.96 g/mile.
	Average VOC vehicle emission factor is 0.84 g/mile.
	Work crew comprised of 15 people
	Every member of the work crew drives their own vehicle.
	Project construction period is 4 months.
	There are 20 work days in a month.
	There are 2 weather days (no work) during the project duration.

Actual work days = 80 days - 2 weather days off.

Actual work days = 78 days

NOx Calculation: 15 workers * 2 trips/work day * 78 work days * 25 miles/trip * 0.96 g of NOx/mile* (1 ton/907200 g)

Total NOx resulting from employee vehicles = 0.06 tons.

VOC Calculation: 15 workers * 2 trips/work day * 78 work days * 25 miles/trip * 0.84 g of VOC/mile* (1 ton/907200 g)

Total VOCs resulting from employee vehicles = 0.05 tons.